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Quarterly Status Report No. 7

April 1 - June 30, 1966

ASPHERIC OPTICAL SYSTEMS

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NGA Review Complete

Summary

The data link with an I.B.M. 7094 is now in operation. It is possible now to use either the program or FLAIR on the 7094.

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We now have two new designs which are optimum solutions. The next step is to compare these with aspheric designs.

Details of Research During This Period.

A. The f/6 Triplet

No further work has been done on this lens. We plan to optimize a single aspheric design.

B. The f/6 Heliar

The f/6 Heliar all spherical system has been further improved. We have encountered a fantastic number of problems in trying to design this lens on the large computing programs. These problems are due to the machines remoteness. Some of the problems will be discussed in the following section on Design Programs.

C. The f/3.5 Triplet

We now have a well corrected 24 inch focal length f/3.5 lens covering a 5" x 5" format. The lens was designed with FLAIR on the 7074. It is, we believe, an optimum design to compare with an aspheric design. We are now attempting to evaluate the improvement from using an aspheric surface.

D. The Lens Design Programs

1) The card-to-card data link is now in and operating. It did not get into real operation until around June 1. The first results were not exactly encouraging. The transmission is slow and the White Sands end does not have an experi-

enced operator. So far we have sent four problems and had them returned by mail. Unfortunately the ☐ program requires a large amount of input so we have not attempted to transmit a problem for his program. The problems sent so far have been for FLAIR. We are now making changes in our program to enable us to send the data in a more condensed form. This data link will certainly become more efficient in time, but it will probably always be somewhat limited in usefulness. However, as long as we have access to the 7094 on our present arrangement, it probably is worth it. So far, this has not contributed significantly to our aspheric study but it should by the end of the summer.

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2) The FLAIR program is now working reasonably well on the 7044 machine at ☐ We have had an agonizing series of problems in adapting ourselves to this machine. ORDEALS was a program design for a 7074 machine which is readily available to us. This program is written to work in conjunction with human intervention at several critical moments. FLAIR was written for a larger and less accessible machine. We have had to introduce much more decision making into this program to make up for this machine's remoteness. Our overall efficiency has gone way down in the process. It is only recently that we have gotten up to a reasonable

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level of efficiency. Up until a few weeks ago we had very little confidence that the program could really optimize a system. As a result, there was very little point in trying to study aspheric designs. During this period we have concentrated on all spherical designs and now have, we believe, several good standards, and are now ready to start comparing them with aspheric designs.

E. Image Evaluation

In our proposed work sheet for this contract we agreed to prepare a set of typical spot diagrams illustrating the aberrations one finds in projection lenses. So far we have developed the plotting routines to do this, but have not made a systematic set of pictures. We plan to discuss the details of this further with before proceeding.

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In connection with the interest in image evaluation problems, we have prepared a program that computes the physical response of images with varying amounts of aberration. We believe that this program should be used to provide response curves for the same images as the spot diagrams. A report on this program will be included in our next report.